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Spallation Neutron Source

Systems Requirements Document for Equipment, Device and Signal Naming

September 2000

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SYSTEMS REQUIREMENTS DOCUMENT
FOR EQUIPMENT, DEVICE AND SIGNAL NAMING

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SPALLATION NEUTRON SOURCE
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FOR EQUIPMENT, DEVICE AND SIGNAL NAMING

January 2000

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1. PURPOSE

This requirements document defines the equipment, device, and signal naming and numbering to be used for all SNS systems.

2. SCOPE

These requirements apply to all devices (beam instrumentation, sensors, actuators, etc.), equipment (power supplies, magnets, RF cavities, targets, moderators, instruments, etc.) and signals in technical systems and conventional facilities. These requirements do not apply to cable numbering, pipe numbering, or location designations throughout the facility.

The designations listed are to be used on operator screens, drawings, schematics, computer software, project databases, equipment name tags, test procedures, and other sources of information.

3. REQUIREMENTS

Format and syntax shall be as shown on Figure 1. Only the device and/or signal name is required on drawings, name tags, etc. where the drawing or device name clearly indicates the system and subsystem including the equipment. However, where the system and/or subsystem are not apparent the full name must be shown.

This naming convention does not specify minimum or maximum lengths of the name components. However, there is one practical restriction on the overall length of a signal name: EPICS version 3.13 can only handle signal names of less than or equal to 28 characters in length. While this restriction will probably be eliminated in a future version, signal names to be implemented in EPICS in the near term should be limited to a length of 28 characters or less.

Requirements for specific naming elements are listed in Table 1 below.

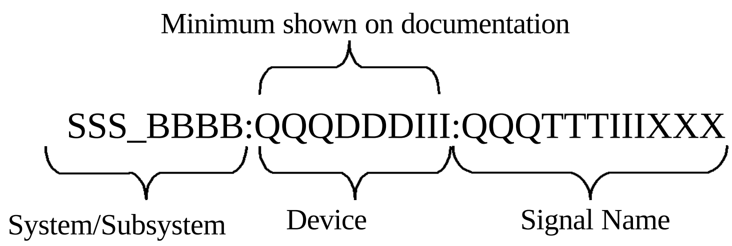

Figure 1: Format and Syntax

Table 1. Name Components

Naming Part	Description	Requirements	Controlled by
Format and Syntax	Entire name	Figure 1 and Syntax rules in Table 2	Project Director
SSS	System	Names in Table 3	Division Director
BBBB	Subsystem	Names in Table 4. May be omitted if subsystem is obvious from system name or device name.	Senior Team Leaders
QQQ	Device Qualifier	Names in Table 5.	Senior Team Leaders
DDD	Device Type	Names in Table 6 or IEEE 803 “Recommended Practice for Unique Identification in Power Plants and Related Facilities” or assigned by STL.	Senior Team Leaders
IIII	Device Instance	Number per Table 10. Numbers are assigned by Level 3 task leaders. They may also be alphabetic.	Level 3 Task Leaders
QQQ	Signal Qualifier	Use is optional. Example qualifiers shown in Table 7. Qualifiers assigned by WBS Level 3 task leaders.	Level 3 Task Leaders
TTT	Signal Type	Table 8 or assigned by Level 3 Task Leader	Level 3 Task Leaders
III	Signal Instance	Use is optional. Assigned by WBS Level 3 task leaders.	Level 3 Task Leaders
XXX	Signal Suffix	Use is optional. Example qualifiers shown in Table 8. Qualifiers assigned by WBS Level 3 task leaders.	Level 3 Task Leaders

Table 2. Syntax Rules

Name Part	Syntax Rules
Syntax rules for the general naming format	1. The delimiter "_" is used to separate system and subsystem names. The delimiter ":" is used to separate equipment or device name from its system/subsystem prefix. The delimiter ":" is also used to separate device name from signal name. 2. Subsystem names are optional and may be omitted if subsystem is obvious from preceding system name or from succeeding equipment or device name. 3. The first character of each name component (System Name, Subsystem Name, etc.) shall be alphabetic. 4. Alphabetic characters "I" and "O" should not be used where they introduce the potential of confusion with the numbers "1" and "0". 5. Letter case shall not be used to distinguish between names. That is, there shall never be two names for which the only difference is letter case. 6. Letter case shall be used to improve readability. The first letter of a word or abbreviation shall be capitalized; succeeding letters shall be lower case. Acronyms shall be all capital letters. 7. The only non-alphanumeric characters used shall be ":" and "_". The colon (":") shall be used only as a delimiter between name parts. The underscore ("_") shall not be used as part of the system name and shall be used only as a delimiter prefix in the subsystem name. However in the equipment and signal name components "_" can be used as desired to improve readability (but not as a first character).

Table 3. System codes

WBS	System Code	System Code Description
1.3	FE	Front End
1.3	LEBT	LEBT
1.3	MEBT	MEBT
1.3	RFQ	RF quadrupole
1.3	Src	Ion source
1.4	Lin	Linac
1.4	DTL	Drift tube linac
1.4	DTLn	Drift tube linac tank n (range 1-6)
1.4	CCL	Coupled cavity linac
1.4	CCLn	Coupled cavity linac module n (range 1-4)
1.4	SCL	Superconducting linac
1.4	SCLn	Superconducting linac module n (range 1-32)
1.4	SCMB	Medium Beta linac
1.4	SCHB	High Beta linac
1.4	SCWM	Superconducting warm section
1.4	CHL	Central Helium Liquefier
1.5	HEBT	HEBT
1.5	Ring	Ring
1.5	RTBT	RTBT
1.6	Tgt	Target systems
1.6	EDmp	Ring extraction dump
1.6	IDmp	Ring injection dump
1.6	LDmp	Linac dump
1.7	ISF	Instrument Support Facilities
1.7	Instr	Instruments
1.8	CF	Conventional Facilities
1.8	Util	Utility systems
1.8	Elec	Power and communication
1.8	Inst	Instrumentation and controls
1.8	Mech	HVAC and utilities systems
1.8	Wste	Waste systems
1.9	ICS	Integrated Control System
1.9	EPS	Equipment Protection System
1.9	PPS	Personnel Protection System

Table 4. Subsystem codes

Subsystem Code	Subsystem Description
	Subsystems used in multiple systems
Accl	Accelerator
Chop	Chopper
Ctl	Control system
Diag	Diagnostics
DIWS	Deionized Water System
Gen	General
Mag	Magnets
PS	Power Supply
RF	RF systems
Tim	Timing
Vac	Vacuum
	Front End Specific Subsystems
Bnch	(MEBT) Buncher
FE	Front End

Subsystem Code	Subsystem Description
Cool	(RFQ) H_2O
PMR	(RFQ) Pi-Mode Rods
Vane	(RFQ) Vane
Wall	(RFQ) Wall
	Linac Specific Subsystems
2KCB	2K Cold box
4KCB	4K Cold box
CCL	Coupled cavity linac
CMn	Cryomodule #n
Cryo	Cryogenics subsystems
DTL	Drift tube linac
GM	Gas management system
HB	High Beta
IGBT	Insulated gate bi-polar transistor
Lin	Linac
MB	Medium Beta linac
SCL	Superconducting linac
SCWM	Superconducting warm section
TL	Transfer line
WCmp	(CHL) Warm compressor system
	Ring Specific Subsystems
Coll	Collimator
Extr	Extraction
HEBT	HEBT
Inj	Injection
Ring	Ring
RTBT	RTBT
	Target Systems Specific Subsystems
TRH	Remote handling system
D2O	Heavy water cooling subsys.
EDmp	Ring extract dump maint subsys)
He	Helium gas subsystem
Hg	Target mercury loop
IDmp	Ring injection dump maint subsys
LDmp	Linac beam dump maint subsys
LWS1	Target utilities Light Water Loop 1 for cooling after to the main Hg heat exchanger
LWS2	Target utilities Light Water Loop 2 for cooling after to the main Hg heat exchanger
LWS3	Target utilities Light Water Loop 3 for cooling after to the main Hg heat exchanger
NFSS	Nuclear facility safety significant system
Shld	Target shielding systems
TMod	Target moderator systems
TPS	Target Protection System
Tran	Target transport systems
Vac	Vessel vacuum subsystem
	Instrument Specific Subsystems

Subsystem Code	Subsystem Description
BmLn	Incident instrument beam line
DAS	Data Acquisition System
FltPth	Flight path
Guide	Instrument neutron guide tubes
Inel1	Spectrometer, microvolt
Inel2	Spectrometer, 100 microvolt
Inel4	Spectrometer, wide angle chopper
Inel5	Spectrometer, large solid angle single crystal
Pow3	Powder diffractometer, long wavelength
Pow6	Powder diffractometer (strain; high resolution)
Pow7	Powder diffractometer (for glasses and liquids)
Ref1	Reflectometer, vertical refl. plane
Samp	Sample chamber
SANS2	Small angle neut scattering, Gen/lower Q high res
SCD1	Diffractometer, general purpose single crystal
	Conventional Facilities Specific Subsystems
BHWS	Building heating water system
CA	Compressed air system
CE	Central exhaust enclosure
CH	CHL building
CL	Central Laboratory and Office building
CNDR	Condenser water return
CNDS	Condenser water supply
CU	Central Utilities Building
CWR	Chilled Water Return
CWS	Chilled Water Supply
CT	Cooling Tower
DCR	Deionized Water Return
DWS	Deionized Water Supply
Elec	Electrical power and communication systems
FE	Front End building
FCryo	Facility cryogenic systems
FGas	Facility gas distribution systems
FVac	Facility vacuum system
FWD	Fire Water
Gnd	Grounding system
GWTS	Gaseous waste treatment systems
HE	HEBT tunnel
HS	HEBT service area
HVAC	Heating, ventilation, and air conditioning systems
HWR	Heating Water Return
HWS	Heating Water Supply
KL	Klystron building
LLLW	Liquid low-level waste treatment systems
LN	Linac tunnel
NG	Natural gas systems
PW	Process Water System
PWTS	Process waste treatment sytems
RG	Ring tunnel
RN	Ring Service Building
RS	RTBT Service Building

Subsystem Code	Subsystem Description
RT	RTBT tunnel
SC	Superconducting RF
SD	Storm Drain
ST	Site
SW	Sanitary Water System
SS	Sanitary Sewer
TA	Target
TB	Target Services Building
TS	Technical Services Building
	Integrated Controls Systems
EPS	Equipment Protection System
ICS	Integrated Control System
PPS	Personnel Protection System
Tim	Timing System

Table 5. Example device qualifiers

Device Qualifier Code	Device Qualifier Code Description
Cs	Cesium
He	Helium
Hg	Mercury
H2	Hydrogen
H2O	Water
N2	Nitrogen

Table 6. Device Codes

Device Code	Device Code Description
Abs	Absorber
AHU	Air handling unit
Aprt	Aperture
Anod	Anode
BCM	Beam current monitor
BCS	Beam control system
BG	Bourdon gauge
BIG	Beam in gap monitor
BIGK	Beam in gap kicker
Bldg	Building
BLM	Beam loss monitor
BPM	Beam position monitor
BPMH	Beam position monitor, horizontal
BPMRF	RF beam position monitor
BPMV	Beam position monitor, vertical
Cab	Instrument and control cabinets
Cbl	Cable
Cath	Cathode
Cav	RF cavity
CCG	Cold cathode gauge
Chllr	Chiller

Device Code	Device Code Description
Cllr	Collar
Cmp	Compressor
Coll	Collimator
CP	CryoPump
CVG	Convectron gage
Damp	Damper
DCBPM	DC beam position monitor
DCH	Dipole magnet, corrector, horizontal
DCV	Dipole magnet, corrector, vertical
DEC	Decapole magnet
DH	Dipole magnet, horizontal
DMC	Dipole-multipole magnet, corrector
DMCH	Dipole-multipole magnet, corrector, H
DMCV	Dipole-multipole magnet, corrector, V
DP	Diffusion pump
Dr	Door
Drvr	Driver
Ds	Door switch
DV	Dipole magnet, vertical
ECV	Electric Control Valve
EKick	Extraction kicker
ExSpt	Extraction Septum
Fan	Fan
FBCM	Fast Beam Current Monitor
FBLM	Fast Beam Loss Monitor
Fil	Filament
Fltr	Filter
FLV	Foreline valve
FLVV	Foreline vent valve
Focus	Focus (Electrostatic)
FV	Fast valve
FS	Flow Switch
Gnd	Ground
GV	Gate Valve
Grid	Grid (bias)
HMM	Higher momentum monitor
Htr	Heater
Hub	Ethernet hub
HX	Heat exchanger
IG	Ion gauge
IkickH	Horizontal Injection kicker
IKickV	Vertical Injection kicker
InjSpt	Injection Septum
IOC	Input Output Controller
IP	Ion pump
IPA	Intermediate Power Amplifier
IPM	Ionization provile monitor
IPMH	Ionization provile monitor, H
IPMV	Ionization provile monitor, V
IX	Ion exchanger
Man	Manifold
Match	Matcher
Mix	Agitators, mixers
Mot	Motor

Device Code	Device Code Description
Mod	Modulator
MV	Manual valve
NEGP	Non-evaporable getter pump
NetSw	Network switch
Oct	Octupole magnet
OCH	Octopole magnet, corrector, H
OctH	Octupole magnet, horizontal
OctV	Octupole magnet, vertical
OCV	Octopole magnet, corrector, V
OPS	Over Pressure Sensor
PA	Power amplifier
Pen	Penetration
PG	Pirani gage
Pipe	Pipe
PIV	Pump isolation valve
PLC	Programmable Logic Controller
Plt	Plate
Pmp	Pump
PMQ	Permanent magnet quadrupole
PrM	Beam profile monitor
PrMH	Beam profile monitor, horizontal
PrMV	Beam profile monitor, vertical
PS	Power supply
PSL	Pressure switch, low
PSH	Pressure switch, high
Q	Quadrupole magnet
QC	Quadrupole magnet, corrector
QCH	Quadrupole magnet, corrector, H
QCV	Quadrupole magnet, corrector, V
QH	Quadrupole magnet, horizontal
QS	Quadrupole magnet, skew
QSC	Quadrupole magnet, skew, corrector
QSCH	Quadrupole magnet, skew, corrector, H
QSCV	Quadrupole magnet, skew, corrector, V
QSH	Quadrupole magnet, skew, horizontal
QSV	Quadrupole magnet, skew, vertical
QTH	Quadrupole magnet trim, H
QTV	Quadrupole magnet trim, V
QV	Quadrupole magnet, vertical
Reg	Regulator
RF	Radio Frequency (amplifier, etc)
RGA	Residual gas analyzer
RP	Roughing pump
RV	Roughing valve
SC	Speed controller
Scrp	Scraper
SGV	Sector gate valve
Shld	Shield
Scrn	Screen
Sptm	Septum
SPX	Speed expander
Steer	Steering electrodes
SCH	Sextupole magnet, corrector, horizontal
SCV	Sextupole magnet corrector, vertical

Device Code	Device Code Description
SH	Sextupole magnet, horizontal
SSCH	Sextupole magnet, skew, corrector, horizontal
SSCV	Sextupole magnet, skew, corrector, vertical
SSH	Sextupole magnet, skew, horizontal
SSV	Sextupole magnet, skew, vertical
SV	Sextupole magnet, vertical
TCG	Thermal conductivity gage
TD	Temperature sensor, diode
Tnk	Tanks, receivers
TMK	Tune monitor kicker
TMP	Turbomolecular pump
TMPS	Turbomolecular pump station
TP	Temperature sensor, platinum RTD
Tun	RF Tuner
TSP	Titanium sublimation pump
Twr	Tower
TX	Temperature sensor, Cernox
VFM	Video foil monitor
Vlt	Vault
Vlv	Valve
Vrc	Variac (filament variable transformer)
VS	Vacuum sector
Vsl	Vessel
VV	Vent Valve
WCM	Wall current monitor
WCMRF	RF wall current monitor
WS	Wire scanner
WSH	Wire scanner, H
WSV	Wire scanner, V
WvG	Waveguide
XV	Exit valve

Table 7. Example Signal Qualifiers

Signal Qualifier Code	Signal Qualifier Code Description
Cs	Cesium
H2	Hydrogen
H2O	Water
He	Helium
Hg	Mercury
N2	Nitrogen
Neg	Negative
Pos	Positive

Table 8. Signal Codes

Signal Code	Signal Code Description
Acc	Acceleration
AGnd	Analog ground
AH	Aperature, H
Ang	Angle

Signal Code	Signal Code Description
Aprt	Aperature
AV	Aperature, V
B	Field
Clk	Clock
Cmd	Command
Cnd	Conductivity
Ctl	Control
Cur	Beam current
DGnd	Digital ground
DP	Differential pressure
DPsn	Downstream position (e.g. collimator downstrm pos)
Dr	Door (e.g. interlock)
Err	Error
Flt	Fault
FltS	Fault summary
Flw	Flow (analog or digital)
Fn	Function
G	Gain
Gnd	Ground
Hall	Hall probe
Hor	Horizontal (e.g. BPM horizontal position)
I	Current
Ilk	Interlock
Lcl	Local (/Remote)
Lim	Limit
Lk	Leak
Lvl	Level
OI	Over-current
OReg	Out of regulation
OT	Over-temperature
OV	Over-voltage
P	Pressure
pH	pH
Psn	Position
Pr	Profile (vector or array) (e.g. horiz profile mon)
Pwr	Power
Rad	Radiation
Rs	Resistivity
Rst	Reset
Spd	Speed
Sts	Status
T	Temperature
Tim	Time
UPsn	Upstream position (e.g. collimator upstream pos)
V	Voltage
Ver	Vertical (e.g. BPM vertical position)

Table 9. Signal Suffixes

Signal Suffix	Signal Suffix Description
Clsd	Closed
Cmd	Command (generally binary)
DAC	DAC reference
Hor	Horizontal
H	High
HH	High-high
In	Inlet
L	Low
LL	Low-low
Opn	Open
Out	Outlet
Set	Setpoint (generally analog)
Ver	Vertical

Table 10: Device Instance Numbering

Subproject	Instance Numbering
Front End	Some devices span all the Front End subsystems and therefore will appear as generic "Front End" devices. Examples from Front End: FE:Chllr_2 Front End; Chiller 2 FE_Ctl:IOC_1 Front End; IOC 1 Most devices are associated with particular subsystems, and follow the general guidelines. Example from Source: Src:Cs_Htr Source; Cesium Heater Example from LEBT: LEBT:Focus_1 LEBT; Focus 1 Example from MEBT: MEBT:QH_1 MEBT; Quadrupole 1, Horizontal

Subproject	Instance Numbering
Linac	DTL: Magnets are named after the drift tube they are associated with. Thus the first horizontally steering dipole in Tank 1 is DTL1:DH28. Drift tubes are counted sequentially throughout the DTL – there is no distinction between tanks. Note this means that magnet numbers are NOT sequential, because there is not a magnet for every drift tube. CCL: Magnets are named (numbered) sequentially (0-47 and 48-49) after the segment they follow. The first one is "QV0." Thus a typical pair would be: CCL1:QV5 and CCL1:QH5. The power supply for a family of magnets would be CCL: PS_Q5_8. SCL: Magnets are named (numbered) sequentially right through both beta sections after the module they follow (0-32). Example names are therefore SCL:QV0 and SCL:QV1.

Subproject	Instance Numbering
Ring	Ring magnets and power supplies instances will be assigned as follows. The ring lattice consists of four superperiods, each containing a 90 degree arc and a long straight section. The four superperiods are labeled A, B, D, and run sequentially along the beam direction from the beginning of one arc to the beginning of the next. The order of magnets in each superperiod X is DHX1, QVX1, …,QHX10, QVX11, QHX12 where D and Q denote dipoles and quadrupoles, and H and V refer to the horizontal and vertical planes. The long straight sections in superperiod X run from QHX8 through QHX12. Devices in the beam transport lines will be labeled similarly except that there will be no superperiod. Devices will be numbered sequentially from a starting point. Examples of Ring power supply devices follow: Ring_PS:DVA3 — Ring, Power Supply, Dipole Vertical, superperiod A, #3 Ring_PS:QHB1 — Ring, Power Supply, Quadrupole, Horiz., superperiod B, #1 Ring_PS:DCHA4 — Ring, Power Supply, Dipole Corrector Horiz, #4 Instance designations for ring equipment not directly related to a specific ring or transport line location will be simply assigned a sequential number. Examples of ring vacuum devices: Ring_Vac:FV1 HEBT_Vac:IP3 RTBT_Vac:SGV2 Ring_Vac:TSP2 Examples of ring diagnostic devices: Ring_Diag:BCM1 — Ring, Diag, BCM, #1 Ring_Diag:BLM5 — Ring, Diag, BLM, #5 Ring_Diag:BPMH1 — Ring, Diag, BPMH, #1 Examples of ring RF devices: Ring_RF:Cav Ring_RF:PA Examples of other ring devices: HEBT:Colim1 HEBT, Collimator#1 HEBT:Colim2 HEBT, Collimator#2 Downstream position Example for vacuum systems: HEBT_Vac:SGV_10 Sector valve located after quadruple QH10.

Subproject	Instance Numbering
Target Systems	The device and instance naming convention should be based on the convention in IEEE 803.1. Instance numbers should be as follows: **WBS NAME NUMBERS** WBS 1.6.1 Mercury loop 5000 – 5499 WBS 1.6.2 Moderator 6000 – 6999 WBS 1.6.3 Reflector 7000 – 7499 WBS 1.6.4 Vessel 7500 – 7999 WBS 1.6.5 Shielding 8000 – 8499 WBS 1.6.6 LWS1 1000 – 1499 WBS 1.6.6 LWS2 1500 – 1999 WBS 1.6.6 LWS3 2000 – 2499 WBS 1.6.6 D2O 2500 – 2999 WBS 1.6.6 Helium 3000 – 3499 WBS 1.6.6 Vacuum 3500 – 3999 WBS 1.6.7 Remote H. 4000 – 4999 WBS 1.6.8 TPS 5500 – 5999 WBS 1.6.9 Linac dump 9000 – 9299 WBS 1.6.9 Beam inj. Dmp 9300 – 9599 WBS 1.6.9 Beam ext. dmp 9600 – 9999 Miscellaneous 0000 – 0999 WBS 1.9.6 Control 8500 – 8999 The offgas and waste handling equipment should be included with one of these loops. Use the miscellaneous category for equipment not included with other systems. Based on this a pressure gauge in the utility loop LWS1 would be the following: Tgt_LWS1:Device1Instance, for example a tank in loop LWS1 would be Tgt_LWS1:Tk1001 A pressure instrument connected to the tank could be named Tgt_LWS1:PE1002
Experiment Systems	Systems in support facilities should use the instance numbering technique used for conventional facilities process instrumentation. For equipment and devices associated with neutron beam lines or instruments, the first digit in the instance number should indicate the beam line or instrument number.
Conventional Facilities	Equipment and associated "Tag Names" should be named according to IEEE 803, IEEE Recommended Practice for Unique Identification in Power Plants and Related Facilities, which references the Instrument Society of America (ISA) Standard S5.1 ("Instrumentation Symbols and Identification"). Device names will use a device qualifier of "bb", where bb is the two letter building designation listed in Table 4. Instance numbers will be a sequence number assuring a unique number. Instance numbering for signals (loops) should be as follows: Power, communication & control systems: 0000 - 1999 HVAC systems: 2000 - 3999 Water systems: 4000 - 5999 Gas systems: 6000 - 7999 Waste Systems: 8000 - 9999

Subproject	Instance Numbering
Cryogenic Helium Liquifier	In general, instruments will be named according to Instrument Society of America Standard S5.1 “Instrumentation Symbols and Identification”. Per this standard, instrument names will be instantiated by loop numbers that are picked from blocks of numbers assigned to each CHL subsystem.